tures upon the mountains of Europe and North America gained for him a great reputation both as an intrepid climber and as a shooter of big game. But his claim to be remembered by naturalists rests upon a far more secure foundation, for many who achieve distinction in the fields indicated are, perhaps, best forgotten.

Most fortunately, Baillie-Grohman soon began to write about his favourite pursuits, and from 1875 onwards many books and innumerable articles in periodicals flowed from his pen. In these writings there is much of interest and importance to the naturalist, for the author was keen-sighted as well as judicious. His love of the chase led him to examine everything connected with its history, and with the utmost patience and industry he explored ancient books, pictures, tapestries, and mouldering heaps of medieval records in search of facts. The results of these researches are well seen in what is probably Baillie-Grohman's greatest book, "Sport in Art" (1913), which is, in effect, an admirable history of the chase as practised in the four centuries between 1400 and 1800. Of even greater interest are his two editions of "The Master of Game," written by Edward, second Duke of York (Shakespeare's "false Aumerle"), between 1406 and 1413. This work, comprising a translation of Gaston de Foix's "Livre de Chasse" (*circa* 1390), and five original chapters on English hunting, is the oldest book of hunting in our language, and as such must always make a special appeal to the student of British mammals.

BY the death of MR. R. W. FRAZER, at sixty-seven years of age, India has lost a learned philologist and student of its literature and philosophy. Joining the Madras Civil Service in 1877, he was invalided in 1881 as the result of exposure on famine duties and service during a local disturbance in the Godavari Hills. On his retirement he became librarian of the London Institution, and it was by his initiative that it was absorbed by the School of Oriental Studies. Frazer lectured extensively on subjects connected with Southern India, and acquired a seldom-rivalled knowledge of Tamil and Telugu. He will be best remembered by his "British India" in the "Story of the Nations" series, his "Literary History of India," and "Indian Thought, Past and Present." He was for a short time secretary of the Royal Asiatic Society, succeeding Miss Hughes, who became his wife, and survives him.

Notes.

THE anniversary meeting of the Royal Society was held on St. Andrew's Day, November 30, and the following officers were elected:—*President:* Prof. C. S. Sherrington. *Treasurer:* Sir David Prain. *Secretaries:* Mr. W. B. Hardy and Mr. J. H. Jeans. *Foreign Secretary:* Sir Arthur Schuster. *Other Members of Council:* Sir Frederick Andrewes, Prof. V. H. Blackman, Sir William Bragg, Prof. A. W. Crossley, Dr. H. H. Dale, Prof. A. S. Eddington, Prof. A. Fowler, Prof. A. Harden, Prof. J. Graham Kerr, Prof. H. Lamb, Sir William Leishman, Sir Gerald Lenox Conyngham, Lord Rayleigh, Prof. O. W. Richardson, Sir Aubrey Strahan, and Prof. J. T. Wilson. Prof. Sherrington delivered the anniversary address, which is abridged on p. 470 of this issue, and presented the medals as follows:—The Copley Medal to Sir Joseph Larmor, who has long held a leading position in the British school of mathematical physics. It may fairly be said that his preliminary work was of the utmost value in paving the way to the modern developments of the theory of relativity. A Royal medal to Dr. Frederick Frost Blackman, distinguished for his contributions to plant physiology, and especially to knowledge of the process of photo-synthetic assimilation of carbon dioxide. A Royal medal to Sir Frank Dyson, who has devoted special attention to investigations of the movements and distances of the stars and of the bearing of these upon the structure of the stellar universe. It was mainly to his foresight and organising ability that we owe the successful observations of the deflection of light by the sun's gravitational field during the eclipse of 1919. The Davy medal to Prof. Phillipe Auguste Guye, in recognition of his work on optically active organic substances, on molecular association, and on atomic weights. The Hughes medal to Prof. Niels Bohr, the author of the conception to which the name "Bohr-atom" has been attached. This conception gave a solution of the long-standing puzzle of the Balmer series of hydrogen, and appears likely to provide a complete explanation of the spectra of the various elements.

AT the meeting of the Royal Geographical Society held on Monday, December 5, the president announced that it is hoped the members of the Mount Everest Expedition will have returned by the end of this week. Messrs. Raeburn and Mallory are already home, and Col. Howard Bury and Messrs. Wollaston and Bullock are on their way. The natural history collection and the photographic plates have also arrived, and the maps will be here within the next fortnight. It is satisfactory to find that the collections have reached home in excellent order. There is a plant belonging to the pink family from a height of 20,400 ft. above sea-level, and there are several kinds of primula—pale yellow, blue, and dark purple—and one with big hanging bells, and many gentians, a remarkable yellow *Pedicularis delphinium*, and some beautiful dwarf rhododendrons. One hundred and sixteen packets of seed in excellent condition are among the treasures which have reached the Royal Geographical Society, of which eighteen packets are of rhododendrons, twelve of primulas, eighteen of meconopsis, and four of gentians. From a height of 19,000 ft., the highest point from which seeds were obtained, is a packet of edelweiss. Then there is a sparrow from 18,500 ft., larks of various species, including a very large callandra lark which may perhaps be new, wagtails, white-headed robins, a chough and cuckoo, rose-finches, bullfinches, and—of fine omen—a blue bird. There are also boxes of birds' eggs, numerous butterflies and moths, and other insects, including bees and fleas, frogs and fishes, and a few mammals. These are all now at Kew and the Natural History Museum being identified and distributed. The photographic plates, all developed, have arrived without a single breakage, and the number of photographs the society now has is more than six hundred. A selection of the best will be exhibited to the public in the Alpine Club Gallery in the middle of January.

Dr. Niels Bohr (Copenhagen), Dr. Johan Hjort, head of the Norwegian Fisheries, and Prof. Paul Langevin (Paris) have been elected honorary members of the Royal Institution.

The American Association for the Advancement of Science will meet in Toronto on December 27–31 in the University buildings. The Royal Astronomical Society of Canada will meet at the same time and assist in the programme of the Association.

The Paris correspondent of the *Times* announces that M. Georges Claude, who has been awarded the Prix le Conte of 50,000 francs (1000*l.*) by the Academy of Sciences for his work in chemistry and physics and the practical application of the results to industry, has requested the Academy to devote one-half of the amount to the Société de Secours des Amis des Sciences and the other half to the research laboratories of the Collège de France.

Prof. Horace Lamb, Sir Ernest Rutherford, Sir Arthur Schuster, and Prof. G. Elliot Smith have been elected honorary members of the Manchester Literary and Philosophical Society. Dr. H. F. Coward has been elected chairman of the chemical section of the society for the ensuing session.

A highly successful course of Swiney Lectures on Geology was completed on December 2 by Dr. J. D. Falconer at the Imperial College of Science, South Kensington. These lectures are delivered annually under the auspices of the trustees of the British Museum, and are designed to stimulate public interest in geological science. The average attendance for the twelve lectures was 261, a gratifying record to all concerned.

The annual general meeting of the Decimal Association was held on November 30 at Stationers' Hall. Proposals for the adoption by the association of a step by step policy in dealing with weights and measures were made, and the following resolution was carried: "That this association, while adhering to the policy of adopting the metric system of weights and measures, recognises that its object can best be obtained in steps, and that the first step should be the dealing with weights."

The Jamaica earthquake of January 14, 1907, so destructive to the city of Kingston, was followed by a number of after-shocks, of which nearly a hundred during the succeeding six months were strong enough to be registered in this country. Stronger than any of these after-shocks, or indeed than any earthquake in the island since 1907, was that which occurred on November 25 last. The shock was of short duration, but it was strong enough to crack the walls of some buildings.

Under the presidency of M. Millerand, President of the French Republic, a meeting was held at the Sorbonne, Paris, at 3 p.m. on November 24 to commemorate the centenary of Ampère's publication of his fundamental laws of electromagnetism. The President was supported by the chief Ministers of public Departments, and the Republican Guard under the direction of M. Balay played selections during the proceedings. Addresses were delivered by Prof. Berthelot, Appell, and Janet and by Messrs. Legouez, Boucherot, Mailloux, and Berard. During the following morning a reception took place at the Conservatoire des Arts et Métiers, and the new gallery of models of telegraphic and telephonic apparatus was opened. An Ampère medal is being struck as a souvenir of the occasion.

Since the advent of aviation visibility over the land has advanced from occupying a secondary position to one of major importance amongst subjects of meteorological investigation. During the past few years the matter has consequently been engaging the close attention of meteorologists, and much progress has been made in the taking of accurate observations. In order to allow a free exchange of opinions on the subject, the meeting of the Royal Meteorological Society to be held at 5 p.m. on December 14 will be devoted to a discussion on "Visibility." The discussion will be opened by Mr. F. J. W. Whipple, who will give a general introduction, while other speakers will approach the matter more particularly from the points of view of the airman, the seaman, and the physicist. The subject of London fogs will also be introduced. Those desirous of obtaining tickets for the meeting should apply to the Assistant Secretary of the Royal Meteorological Society at 49 Cromwell Road, South Kensington.

At the monthly meeting of the Zoological Society of London held on November 23 twenty new fellows were elected to the society, eighty-seven candidates proposed for election as fellows, two as foreign members, and eight as corresponding members. The report of the council showed that 509 additions had been made to the society's menagerie during the quarter, including 165 by presentation, 182 by purchase, 98 by deposit, 29 in exchange, and 35 born in the gardens. Special mention is made of a collection of mammals, birds, and reptiles from New Guinea and Aru obtained by Mr. Frost, which included four species of birds-of-paradise and several rare doves and parrots new to the collections. The number of visitors during the quarter showed a decrease of 108,735 and the receipts a decrease of 844*l.* as compared with the corresponding period of last year. Two hundred and ninety-eight new fellows have been elected to the society since January 1. The society's silver medal was presented to H.E. Capt. C. H. Armitage, Chief Commissioner of the Northern Territories, Gold Coast, for his many valuable gifts to the collections from 1904.

On the arrival of the *Quest* at Rio de Janeiro Sir E. Shackleton announced a change in the plans of his Antarctic expedition. According to the *Times,* Rio de Janeiro instead of Cape Town will be the base of the expedition, and the *Quest* was to sail about December 5 direct to South Georgia, arriving there about Christmas Day and leaving at the New Year for Enderby Land *via* Bouvet Island. An attempt will be made to prove the existence or non-existence of Thompson Island, an island reported to lie in the vicinity of Bouvet Island, but probably identical with the latter. Bouvet Island has been visited only once, namely, by the *Valdivia* in 1898, since its discovery in 1739. No landing has been made, and the island is reported ice-covered and inaccessible. Sir E. Shackleton hopes to enter the ice about January 22, and after visiting Enderby Land, if the ice permits, to arrive again at South Georgia by the end of March. There the *Quest* will coal and sail for Tristan da Cunha and Cape Town. The change in plans was attributed to the delay due to contrary winds and the weakness of the auxiliary engines. New topmasts were being fitted in order to increase the spread of canvas and allow the vessel to be driven through the pack-ice under sail. On the voyage to Rio de Janeiro a call was made at St. Paul's Rocks, which no ship appears to have visited since the *Scotia* in 1902. It is not reported if landing was found to be possible.

The benefits conferred upon the native races of India by the presence in their midst of an energetic body of irrigation engineers were admirably set forth in two articles, entitled "Canals of the Punjab," by Lieut.-Col. Aubrey O'Brien, which appeared in the *Daily Telegraph* for November 25 and 30. The articles dealt with the great irrigation schemes already carried out and those for which plans have been prepared. By the harnessing of the waters of the Jumna, Sutlej, Ravi, Chenab, and Jhelum the area of irrigated land within the Punjab has been increased since the Mutiny from half a million to more than ten million acres. Worked entirely for the benefit of the people of the Punjab, the canals already return to the revenues of the province a profit of 14½ per cent. on the capital spent on them, and this with the lightest of dues. The present value of crops on 10,000,000 acres is considered to be not less than 50,000,000*l.* Great as these achievements are, they bid fair to be surpassed in importance and interest by the schemes due to Mr. W. H. Ives, the Chief Engineer of the Punjab, one of which, the Sutlej Valley Project, aims at irrigating very large areas in British territory, and also in the native States of Bahawalpur and Bikanir. It is estimated that this scheme, which will cost some 14,000,000*l.*, will irrigate 9,000,000 acres. On the completion of this it is proposed to carry out another large scheme where the Sutlej emerges from the hills. The river here runs for forty miles in a great loop, piercing a range 3500 ft. high, and then turning back almost parallel to its previous course. At the gorge of Bhakra a dam 395 ft. high—50 ft. higher than any dam at present in existence—will be built, impounding a volume of water about three times greater than that held up by the Assouan Dam on the Nile, and it is anticipated that by utilising the water for driving turbines, power can be obtained up to 300,000 horse-power.

The Copper Eskimo of Coronation Gulf were studied by the recent Canadian Arctic Expedition. Mr. D. Jenness, the anthropologist of the expedition, gives an account of these people in the *Geographical Review* for October. Until 1838 these Eskimo, who inhabit Coronation Gulf, Union and Dolphin Straits, and Kent Peninsula, were practically unknown, and after that date they were seldom encountered until the Canadian Arctic Expedition visited them in 1914. Mr. Jenness says that he found them still practically in the Stone age, but changes have occurred in the last few years. Contact with European fur traders has led to the introduction of metal goods, rifles, changes in clothing and mode of life. The habits of the people are changing, and their greater success in hunting bids fair to exterminate the caribou. Mr. Jenness views with some concern the contact of civilisation with these Eskimo, and, by reason of scarcity of caribou and introduced white man's diseases, fears that before long they may dwindle to a degenerate remnant on the way to extinction.

A deplorable instance of misdirected energy is recorded in the November issue of *British Birds,* where Mr. W. Rowan, in the course of a most admirable account of the breeding haunts and habits of the merlin, tells us that on the two moors which formed the area of his investigations "it is but rarely that a hawk attempting to breed survives . . . to tell the tale." The moors in question—the Barden and Embsay moors—form a single stretch nearly twenty square miles in area. During nineteen successive years no less than nineteen pairs of merlin were killed on *one* nesting-site only—"one pair each year without a miss, and not a single egg was hatched." Moreover, it would appear that every one of these wretched birds was trapped. The annual average of breeding merlins on this moor appears to be three or four pairs; not a single pair succeeds, save perhaps by the merest accident, in escaping destruction. This lamentable state of affairs, we fear, can be remedied only by the help of the owner of the moor, and it is to be hoped that steps will immediately be taken to extend protection against this senseless and unwarranted persecution, for there is no justification for the implied game-destroying habits of these birds.

To the *Lancashire and Cheshire Naturalist* for July–August Dr. J. Cosmo Melville contributes an interesting series of notes on the Sidebotham collection of Lepidoptera in the Manchester Museum. Very nearly all the British species are represented in the collection, and it contains fine series of many varieties, and also material of historical interest. The now extinct butterfly *Chrysophanus dispar* is represented by twenty-seven perfect specimens, and the very rare hawk moth, *Choerocampa celerio,* by five examples with full data. There are two Staffordshire examples of *Leucodonta bicoloria,* and one of the two authenticated British examples of *Byrophila algae* is in this collection. In a brief article on the growth of the Manchester Museum Mr. T. A. Coward points out that that institution is now exceptionally rich in valuable collections; in fact, few provincial museums can vie with it in this respect. The famous Dresser collection of birds and eggs and the valuable ornithological library attached thereto are almost indispensable to serious students. In the botanical department of the museum are located the huge herbaria of Dr. Cosmo Melville and Mr. Charles Bailey, along with the Barker and other cryptogamic collections.

THE annual report of the Meteorological Office for the year ended March 31, 1921, has been submitted to the Air Council for the first time since the control has been taken over from the Lords Commissioners of His Majesty's Treasury. The period dealt with was a time of transition and reorganisation, an important change being the retirement of Sir Napier Shaw from the directorship after twenty years' service and the appointment of Dr. G. C. Simpson to the vacant position. Among the many changes made in the carrying on and extension of the work at its different centres of activity a considerable increase has been made in the staff employed. At the commencement of the year the clerical, technical, and unclassified posts numbered 182, and at the end of the year 213, leaving 65 vacancies to be filled to bring the staff to its required strength. There is a restriction that candidates must be drawn from ex-Service men. The Marine Division of the Office deals with the issue of meteorological and ocean-current charts, together with other weather information for the sailor. The Forecast Service, in addition to publishing the *Daily Weather Report,* is taking advantage of every opportunity to improve the value of the daily weather forecasts and harvest forecasts, a spell notification being issued for the latter when conditions are favourable for two or three days of fair weather. Climatological observations are issued in the *Weekly Weather Report* and in the *Monthly Weather Report.* The meteorology of the whole globe is also now regularly discussed. The British Rainfall Organization is being controlled by the Meteorological Office, and the publication of rainfall statistics for the British Isles occupies much time. Observations on the upper air also involve a large amount of work.

THE Faraday Society has issued as a separate pamphlet of 83 pages an account of the discussion on electro-deposition and electro-plating which took place at the joint meeting of the society and the Sheffield Section of the Institute of Metals in November, 1920. Of the recent improvements referred to in the papers read and the discussion which ensued, one of the most important is the electro-deposition of the water-jackets of aeroplane engines and the possibility opened out by this success of building up elaborate parts of machinery by the same process. The advantages of cobalt-plating have been recognised for twenty years, but it is pointed out that there is still difficulty in securing the perfect adhesion of thick deposits. The influence of colloids in the depositing tank on the properties of the deposit is still imperfectly understood, although it seems undoubted that their presence leads to a decrease in the size of grain deposited. The chairman and one of the speakers expressed regret that some of the authors of papers had not made themselves acquainted with the work of previous investigators before commencing their own experiments.

IN the *Chemical News* of October 28 Prof. B. Brauner, of Prague, discusses the official report of the International Commission on Chemical Elements (NATURE, August 18, p. 787). He cannot accept the principle that "exact atomic weights are now becoming factors of an analytical calculation rather than features of a chemical hypothesis." Prof. Brauner has also the support of another authority on atomic weight determinations, Sir Edward Thorpe, who in his presidential address to the British Association at Edinburgh, considered it of importance to "determine with the highest attainable accuracy the departures from the whole number rule." Prof Brauner raises the following questions: "Why do we find with our chemical processes and the balance that the *atomic weights* of the pure elements, C, N, P, S, are *larger* than their *atomic masses* [as found by the positive-ray method]; why those of As, I, and Cs are smaller, and why those of He, O, F, Na, are exactly equal to their atomic masses, or in other words, why is the hypothesis of Prout in its modern form valid foı atomic masses, but only in four out of twelve cases for the corresponding atomic weights? Another interesting question arises: Why are Aston's isotopes, as far as we know, always mixed up in the same proportion?" In the *Philosophical Magazine* for October Sir E. Rutherford gives reasons for the value, 14·01 (adopted by chemists) rather than 14·00, found by the positive-ray method, and suggests that a refinement of the latter method might distinguish between the two values.

WE have received from Messrs. Kodak a forty-eight-page booklet, entitled "X-Rays," which they are distributing to the members of the medical profession. It explains in a clear way the funamental laws of practical importance that underlie the production and use of X-rays, giving, for example, the relationship between the length of the spark gap and the required exposure, and the quality of the negative. The development and other treatment of the exposed plate or film is dealt with at length. The special aim of the booklet is the standardisation of procedure, so that the uniformity of method shall simplify diagnosis.

SINCE the introduction of the steam turbine the question of the production of high-speed gear-wheels has occupied the attention of many engineers. Generally, the type of gear-wheels employed has been double-helical. In a paper read by Eng.-Lt.-Comdr. L. J. le Mesurier on November 22 before the North-East Coast Institution of Engineers and Shipbuilders, the Maag gearing is described and the process of manufacturing it is explained. This gearing is of the straight-toothed type, and has been developed by the Maag Gear Co., of Zurich. Means have been found by which straight-tooth spur gears can be employed successfully under conditions demanding the highest possible peripheral speeds and loads per unit width of tooth. The methods of production ensure the requisite degree of accuracy, and at the same time provide a tooth form which is considered to give the most favourable conditions of sliding contact during engagement. A novel grinding process has also been devised whereby it is possible to generate a correct profile on a case-hardened tooth surface by means which are independent of the wear which must take place on the grinding disc. The compensating arrangements in the grinding machine are extremely interesting, and keep the grinding planes in their correct position to within ±1/1000 mm. The gear has been applied to several ships and to a large number of electrical plants and electric-locomotive drives.

"A WINTER GUEST," the seasonable and striking Christmas card published by the Royal Society for the Protection of Birds (23 Queen Anne's Gate, S.W.), represents the redwing, sometimes called the "Norwegian Nightingale," though known in England only as a winter visitor. The picture is reproduced in colour from a painting by Mr. H. Gronvold, and gives very happily the character and the appealing expression of the little traveller. It can be had, with calendar, for 5*d.* by post.

ERRATUM.—The Poets' Corner of Westminster Abbey is in the south transept, and not the north, as stated in the article on "Science in Westminster Abbey" in last week's NATURE, p. 437.

Our Astronomical Column.

THE EFFECTIVE WAVE-LENGTH OF THE LIGHT OF GALACTIC STARS.—Prof. O. Bergstrand contributes a paper on this subject to the centenary number of *Astron. Nach.* The research is based on a series of plates of the star-cloud in Cygnus obtained with a 15-cm. triple objective prism. The spectral types of the brighter stars were taken from the Henry Draper catalogue, and the following table shows the correlation between type and effective wave-length λ.

Type	λ	Type	λ	Type	λ
O	411μμ	F	421	K	429
B	416	G	423	M	439
A	419	G5	425		

Only two M stars were available, both probably giants. From the evidence of the G5 and K stars, the author concludes that dwarfs have a smaller value of λ than giants of the same type.

An analysis is then given of the values of λ for the fainter stars down to magnitude 13·4. It is pointed out that the percentage of white stars is more than 60 for stars brighter than 11·4 m., and then drops suddenly to less than 50. He explains this by assuming that the white stars have the highest absolute brightness, and so are more distant than yellow or red stars of the same apparent magnitude. Hence we reach the limits of our local star system sooner in the white stars than in the yellow ones, causing a drop in the percentage for the fainter stars. Taking 0·0 as the absolute magnitude of an average giant white star, the radius of our local system is found to be 2500 parsecs.

THE DYNAMICAL EQUILIBRIUM OF THE STELLAR SYSTEM.—Prof. A. S. Eddington contributes an important paper to the centenary number of *Astron. Nach.*, in which he makes a further advance in the solution of this problem; his first approximation, in which he took the shape of the system as spherical, was published in Monthly Notices, R.A.S., vol. 75. He passes on in the present paper to consider the much more difficult problem of an oblate system, and succeeds in finding one exact solution as follows: A rotating system that has settled down to a steady state may be presumed to be oblate. If we divide it into two identically equal systems, and reverse the direction of rotation of one of them, we shall have a non-spherical system in equilibrium, with no rotation as a whole, but with preferential motion in a transverse direction. The solution is worked out in detail for a homogeneous spheroid, which is shown to be strictly analogous to Maclaurin's hydrodynamical spheroid. It is inferred that non-homogeneous solutions exist. In conclusion, he points out that it is quite likely that the stellar system has not yet attained dynamical equilibrium, and may be collapsing somewhat rapidly towards a steadier condition. He has hopes that the advance of knowledge of stellar masses and velocities may enable the matter to be decided by using the principle that in dynamical equilibrium the total kinetic energy is half the exhaustion of potential energy.

OBSERVATIONS WITH THE COOKSON FLOATING TELESCOPE.—This instrument, which floats in a circular tank containing mercury, was designed by the late Mr. Bryan Cookson, and given after his death to the Syndics of the Cambridge University Observatory. It has been on loan at the Royal Observatory, Greenwich, since 1911, and a memoir just published discusses the observations of the first seven years. The primary object was the redetermination of the aberration constant, while the variation of latitude is a useful by-product. Pairs of stars are selected at about the same distance from the zenith and on opposite sides, and with right ascension difference of a few minutes of time; their magnitudes vary from 5 to 6·5. The trails of brighter or fainter stars are too broad or too faint for accurate measurement. Three solutions are given for the aberration constant and for the corresponding value of the solar parallax as follows:—

Ab. const.	Parallax	
″		
20·442	8·815	General solution.
20·455	8·810	Discordant plates rejected.
20·460	8·808	Correction for wind direction applied.

The probable errors of aberration and parallax are 0·013″ and 0·006″ respectively. The third solution resulted from an examination of the "night errors," which led to the conclusion that they depend largely on the direction of the wind. This, combined with the dissymmetry of the ground-level to the north and south of the instrument, is presumed to produce inclination of the atmospheric strata and anomalous refraction. It will be seen that the values for the parallax do not differ too widely from Mr. Hinks's value 8·806″. The period of observation is, however, not considered quite long enough to eliminate accidental error, and the observations are being continued for another seven years.